Claims

1. A semiconductor device comprising

- a semiconductor component (12), particularly a power laser diode bar, disposed on a cooling element (20),

- said cooling element (20) containing in its interior a cooling channel (26) serving to conduct a coolant and comprising in at least one region (32) microstructures for effective heat transfer to said coolant,

characterized in that

said semiconductor component (12) substantially completely overlaps said region (32) of said cooling channel (26) comprising said microstructures, and disposed between said semiconductor component (12) and said cooling element (20) is an intermediate support (16) so arranged and configured that it compensates for mechanical stresses between said semiconductor component (12) and said cooling element (20) occurring as a result of differing thermal expansions of said semiconductor component (12) and said cooling element (20).

2. The semiconductor device as set forth in claim 1,
characterized in that
said intermediate support (16) has a high modulus of elasticity such that it compensates for the mechanical stresses substantially within the elastic strain regime.

3. The semiconductor device as set forth in claim 1,
characterized in that
said intermediate support (16) has a higher thermal conductivity than copper, particularly a thermal conductivity that is about 1.5 times higher than that of copper.

4. The semiconductor device as set forth in one of claims 1 to 3,
characterized in that
the thermal expansion coefficient of said intermediate support (16) is adapted to the thermal expansion coefficient of said semiconductor component (12).

5. The semiconductor device as set forth in at least one of the preceding claims, characterized in that
said semiconductor component (12) is connected by means of a hard solder (14) to said intermediate support (16).

6. The semiconductor device as set forth in at least one of the preceding claims, characterized in that
said intermediate support (16) is connected by means of a hard solder (18) to said cooling element (20).

7. The semiconductor device as set forth in at least one of claims 4 and 5, characterized in that
a solder based on an AuSn solder is used as said hard solder (14, 18).

8. The semiconductor device as set forth in at least one of the preceding claims, characterized in that
said intermediate support (16) is fabricated of molybdenum, tungsten, a copper/molybdenum alloy or a copper/tungsten alloy, preferably having a copper content of about 10% to about 20%.

9. The semiconductor device as set forth in at least one of the preceding claims, characterized in that
said intermediate support (16) comprises a diamond composite material, particularly a diamond/metal matrix material, which particularly contains at least one of the material combinations diamond/copper, diamond/cobalt and diamond/aluminum.

10. The semiconductor device as set forth in at least one of the preceding claims, characterized in that
said semiconductor component (12) is a power laser diode bar.

11. The semiconductor device as set forth in claim 10,
characterized in that
the semiconductor laser diode bar (12) and a beam-collimating device (40), particularly a microlens for beam collimation, are disposed on one and the same surface of said cooling element (20).

12. The semiconductor device as set forth in at least one of the preceding claims,
characterized in that
said cooling element (20) is composed of plural stacked, areally interconnected layers, a portion thereof being structured, to form in the interior of said cooling element said cooling channel (26) for conducting said coolant.

13. The semiconductor device as set forth in claim 10,
characterized in that
the layers of said cooling element (20) are formed at least in part by the etching of structured copper foils.

14. The semiconductor device as set forth in at least one of the preceding claims,
characterized in that
the length of the microstructured region (32) is at least equal to or greater than the length of said semiconductor component (12) and said microstructured region (32) completely overlaps said semiconductor component (12) in the lengthwise direction.

15. The semiconductor device as set forth in at least one of the preceding claims,
characterized in that
the width of said microstructured region (32) is equal to or greater than the width of said semiconductor component (12) and said microstructured region (32) completely overlaps said semiconductor component (12) in the widthwise direction.